



U.S. Department of Energy  
Idaho Operations Office

# ***Field Sampling Plan for Waste Area Group 10 Track 2 Investigation of Sites CFA-54, MISC-45, and TRA-62***

July 2005

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## **Idaho Cleanup Project**

**Field Sampling Plan for Waste Area Group 10  
Track 2 Investigation of Sites CFA-54, MISC-45,  
and TRA-62**

**July 2005**

**Prepared for the  
U.S. Department of Energy  
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## ABSTRACT

This field sampling plan describes a series of field investigations for Operable Unit 10-08 sites at the Idaho National Laboratory. The sites consist of a buried waste pipe south of the CFA-674 building (Site CFA-54), a dirt pile with naval smoke cans near the Idaho Nuclear Technology and Engineering Center (Site MISC-45), and an abandoned discharge pipeline between the TRA-608 building and the TRA-701 chemical waste pond (Site TRA-62). The activities support the Track 2 investigation required by the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*.

This field sampling plan together with the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning* constitute the sampling and analysis plan to support the Track 2 investigations. The field sampling plan provides guidance for the site-specific activities, including sampling, quality assurance, quality control, sample analysis, and data management. Use of the field sampling plan will help to ensure that data are scientifically valid, defensible, and of known and acceptable quality. The quality assurance project plan describes the quality assurance/quality control protocols that will be used to achieve the data quality objectives specified in this plan.



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## ACRONYMS

|        |   |
|--------|---|
| AA     | alternative action  |
| bgs    | below ground surface  |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFA    | Central Facilities Area   |
| COPC   | contaminant of potential concern                                      |
| DD&D   | deactivation, decontamination, and decommissioning                    |
| DQO    | data quality objective  |
| DS     | decision statement  |
| EBSL   | ecologically based screening level                                    |
| EPA    | U.S. Environmental Protection Agency                                  |
| FFA/CO | Federal Facility Agreement and Consent Order                          |
| FSP    | field sampling plan   |
| FTL    | field team leader   |
| GDE    | guide   |
| IDW    | investigation-derived waste   |
| IEDMS  | Integrated Environmental Data Management System                       |
| INL    | Idaho National Laboratory   |
| INTEC  | Idaho Nuclear Technology and Engineering Center                       |
| MCP    | management control procedure  |
| OU     | operable unit   |
| PPE    | personal protective equipment   |
| PRD    | program requirements document   |
| PRG    | preliminary remediation goal  |
| PSQ    | principal study question  |
| QA     | quality assurance   |

|       |                                   |
|-------|-----------------------------------|
| QA/QC | quality assurance/quality control |
| QAPjP | quality assurance project plan    |
| QC    | quality control                   |
| RTC   | Reactor Technology Complex        |
| SAM   | Sample and Analysis Management    |
| TRA   | Test Reactor Area                 |
| UCL   | upper confidence limit            |
| WAG   | waste area group                  |
| WGS   | Waste Generator Services          |

# **Field Sampling Plan for Waste Area Group 10 Track 2 Investigation of Sites CFA-54, MISC-45, and TRA-62**

## **1. INTRODUCTION**

This field sampling plan (FSP) provides guidance for sample collection at three Waste Area Group (WAG) 10 sites at the Idaho National Laboratory (INL) in accordance with the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991):

- The buried waste pipe south of the Central Facilities Area (CFA)-674 building (Site CFA-54)
- The dirt pile and naval smoke cans near the Idaho Nuclear Technology and Engineering Center (INTEC) (Site MISC-45)
- The abandoned discharge pipeline between the Test Reactor Area (TRA)-608 building and the TRA-701 chemical waste pond (Site TRA-62) at the Reactor Technology Complex (RTC).

Samples will be collected to evaluate the presence and distribution of contaminants at these sites, which are regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This investigation will include an assessment of the risks to human and ecological receptors for site-specific exposures.

This FSP is implemented in conjunction with the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning* (DOE-ID 2004a) and the *Health and Safety Plan for the Waste Area Group 10 Track 2 Investigation Sites* (ICP 2004a). Together, the quality assurance project plan (QAPjP) and this Track 2 FSP constitute the sampling and analysis plan for the three sites.

These sites are being addressed under a Track 2 investigation. The purpose of the investigation is to provide additional data for the WAG 10 Operable Unit (OU) 10-08 remedial investigation/feasibility study. Conceptual site models were developed in the *Scope of Work for Waste Area Group 10 Track 2 Investigation for Sites CFA-54, MISC-45, and TRA-62* (DOE-ID 2005a). The models show the potential exposure pathways for each site.

### **1.1 Background and Description**

The INL site occupies 890 mi<sup>2</sup> of the northwestern portion of the eastern Snake River Plain (Figure 1-1) and was divided into 10 WAGs under a federal facility agreement and consent order (FFA/CO) (DOE-ID 1991). WAGs 1 through 9 correspond to individual INL facility areas, while WAG 10 corresponds to INL sitewide concerns, including the Snake River Plain Aquifer. WAG 10 also includes sites discovered within the other WAGs after their records of decision have been signed.

### **1.2 Project Organization and Responsibility**

The organizational structure of this project, including job titles and the individuals who will be filling key managerial roles and lines of responsibility and communication, is discussed in the *Health and Safety Plan for Waste Area Group 10 Track 2 Investigation of Sites CFA-54, MISC-45, and TRA-62* (ICP 2005).

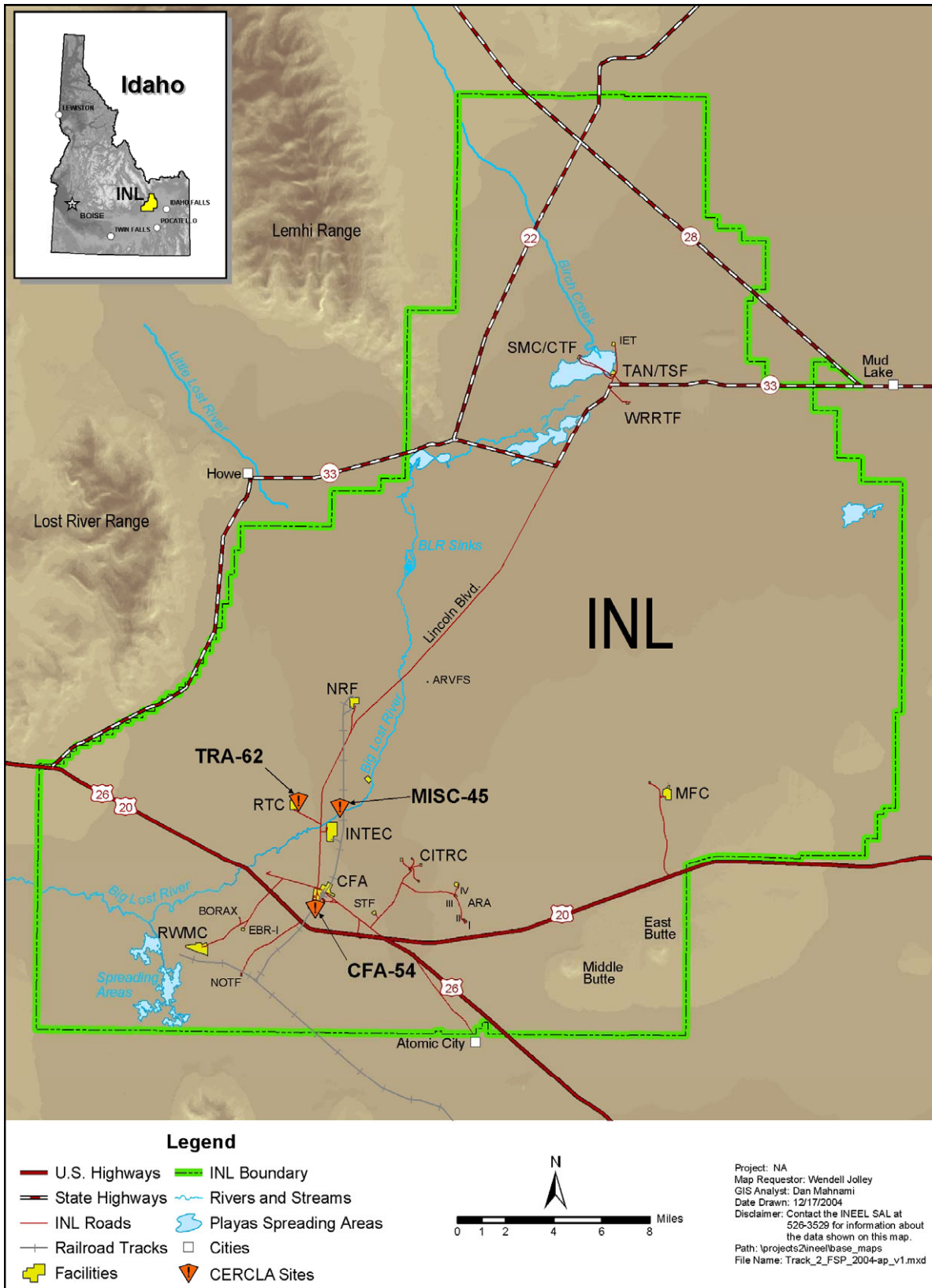


Figure 1-1. Idaho National Laboratory site.

## **1.3 Buried Waste Pipe south of CFA-674 (Site CFA-54)**

### **1.3.1 Site Background and Description**

Site CFA-54 consists of a buried 6-in. clay pipeline that was used to carry waste from the Chemical Engineering Laboratory in the CFA-674 building to the CFA-04 pond about 400 ft to the southeast. The pipe is located approximately 6 ft below ground surface (bgs). The locations of the CFA-674 building, the CFA-04 pond, and the pipeline are illustrated in Figure 1-2. The Chemical Engineering Laboratory operated from 1953 to 1965 and was used to study a nuclear waste calcining process on simulated (no fuel) nuclear fuel rods. The two primary waste streams discharged through the pipe included mercury-contaminated calcine and the liquid effluent from the laboratory experiments.

Although samples have not specifically been collected to evaluate Site CFA-54, sampling and analyses were conducted at the CFA-04 pond in 1989, 1993, 1994, 1995, 1997, and 1998 in support of the comprehensive remedial investigation/feasibility study for OU 4-13 at CFA (DOE-ID 2000) to characterize the nature and extent of contamination in the pond. As part of the 1997 sampling, soil along the pipeline was sampled from two locations. At a point 95 ft from the pipe opening back toward the building, no contamination was detected in the soil beneath the pipe. However, mercury was present at a concentration of 73 mg/kg in a sample 205 ft from the opening back toward the building. As a result of the remedial investigation/feasibility study, excavation of contaminated soil in the pond was recommended.

The remedial action conducted in 2003 for the CFA-04 pond did not include action for the pipe, because it was not officially included in the FFA/CO description of the pond. Even so, samples were collected from the material within the pipe and the soil directly beneath the pipe opening when it was unearthed during remedial activities for the pond. The sample taken from the material within the pipe had a mercury concentration of 61 mg/kg. The soil directly beneath the pipe opening contained mercury at a concentration of 34 mg/kg (this is the average of duplicate sampling at this location [24, 33, and 46 mg/kg]) (Giles 2005). Figure 1-2 shows the pipeline and the results of samples taken from along the pipeline. These samples were evaluated using a field mercury analyzer, as discussed in the remedial action report (DOE-ID 2004b), and in a New Site Identification Form prepared in May 2004 for Site CFA-54 (Hodel 2004).

### **1.3.2 Contaminants of Potential Concern**

Based on pre-remedial action samples collected from the CFA-04 pond in 1998, the contaminants of potential concern (COPCs) identified are aroclor-1254, arsenic, mercury, Cs-137, U-234, U-235, and U-238 (DOE-ID 2000). Because the pond was fed by the pipeline that comprises Site CFA-54, these same constituents are considered COPCs for the pipeline.

## **1.4 Dirt Pile with Naval Smoke Cans near INTEC (Site MISC-45)**

### **1.4.1 Site Background and Description**

Site MISC-45, located approximately 1 mi north of INTEC near the intersection of the Big Lost River and the railroad tracks (see Figure 1-3), consists of several empty 5-gal canisters labeled “Smoke, Pot, Floating, HC-M4A2.” These canisters are scattered at the base of a dirt pile. Smoke cans similar to these were typically used to create smokescreens during U.S. Naval training activities at the INL site in the post-World War II era. Historical information revealed the smoke cans formerly contained Type C hexachloroethane, zinc oxide, and grained aluminum. Metal by-product compounds that

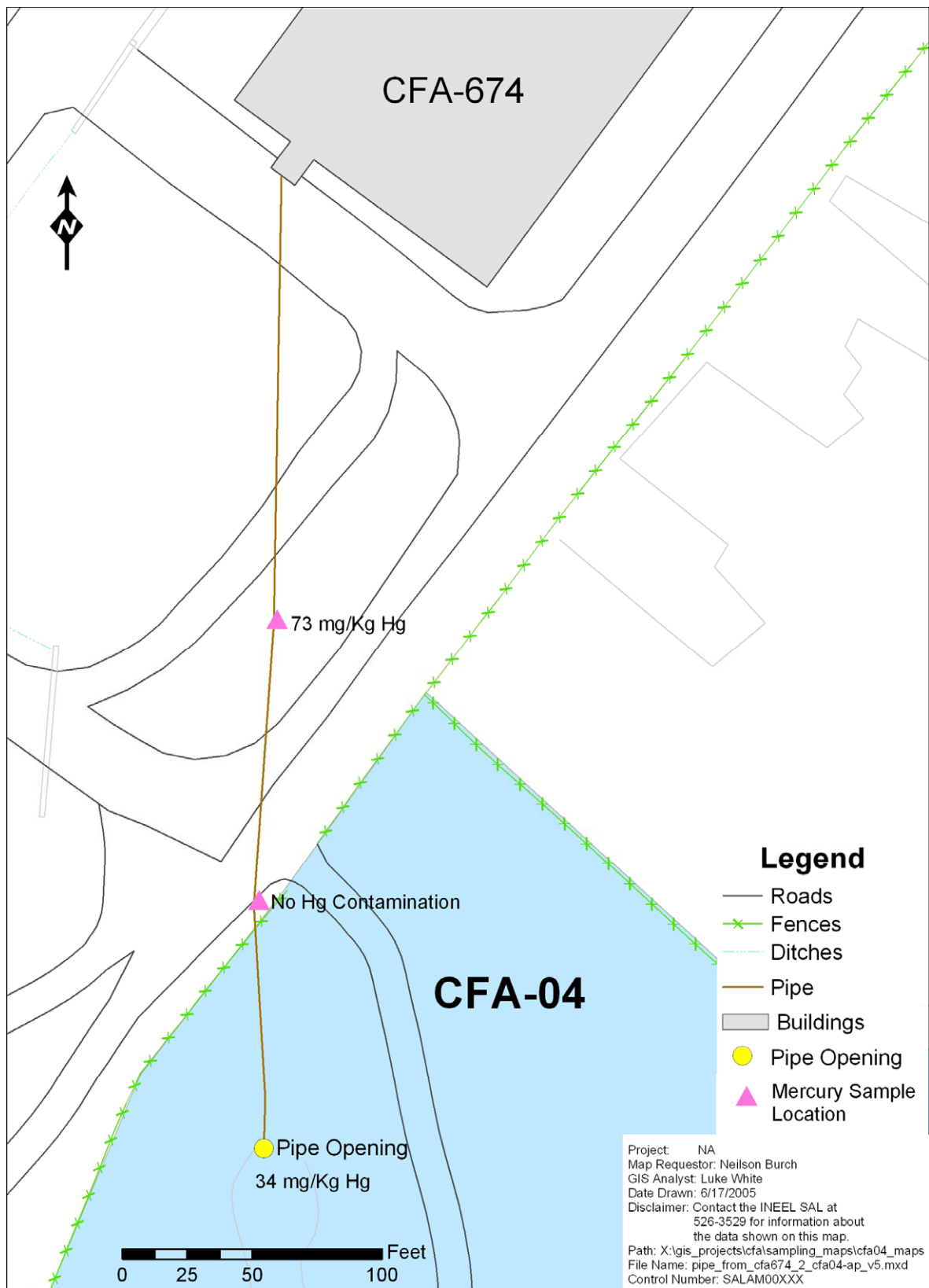


Figure 1-2. Location of the buried waste pipe south of CFA-674 (Site CFA-54).

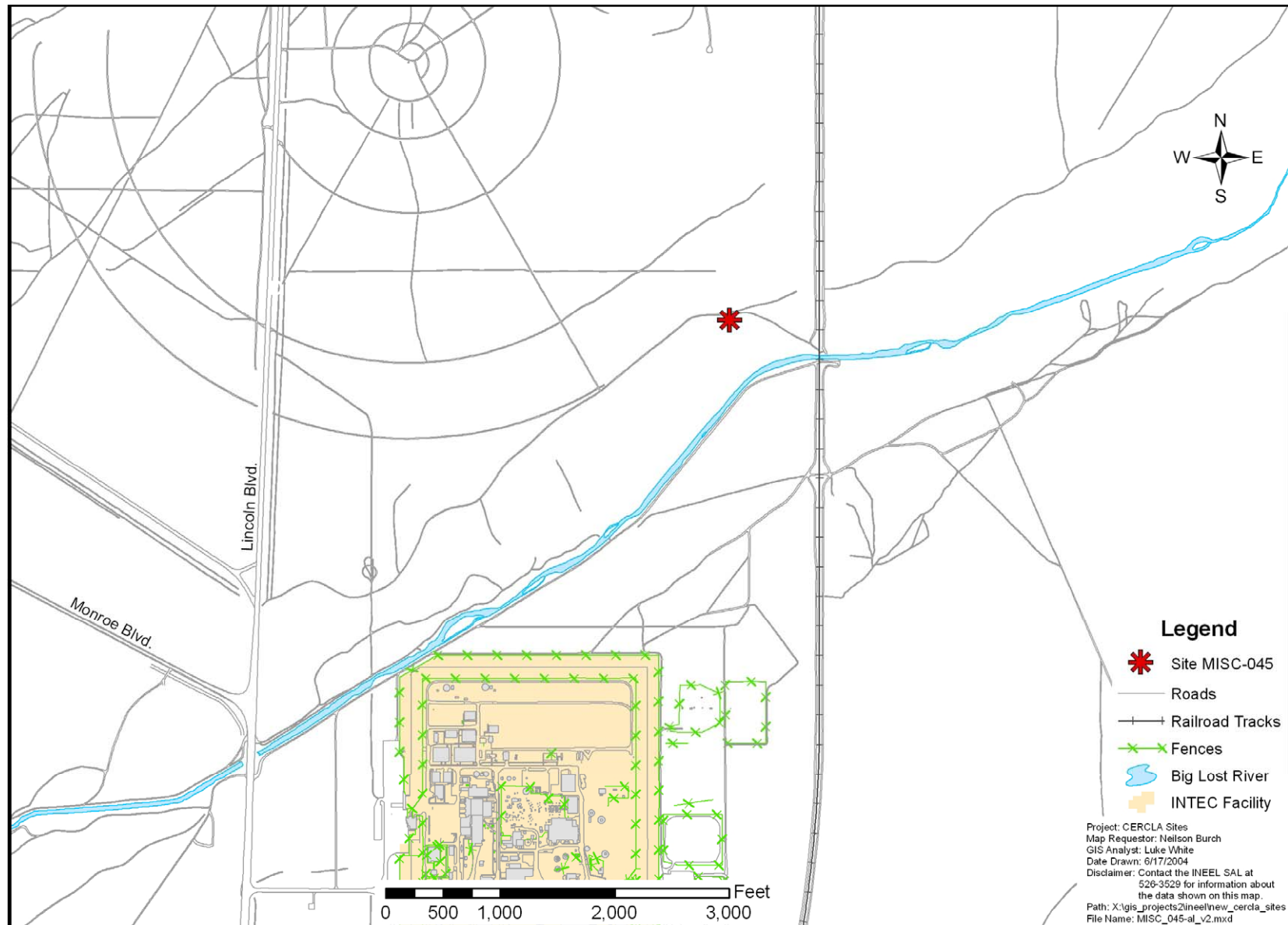


Figure 1-3. Location of the dirt pile with naval smoke cans near INTEC (Site MISC-45).

potentially formed in the hexachloroethane smoke emission included zinc chloride, ammonium chloride, cadmium chloride, lead chloride, arsenic (chlorides and oxides), and aluminum oxide. The smoke canisters are empty, and no residual material is evident on the ground surface. Vegetation surrounding the smoke canisters is healthy and well established, giving no indication of contaminant migration.

The origin of the dirt pile is unknown. The pile is approximately 15 to 20 ft long, 10 ft wide, and 8 ft high and resembles other dirt piles found across the INL site. A New Site Identification Form was prepared for this site in 2000, placing it in OU 10-08 (Burns 2000). The subsequent Track 1 decision documentation package (DOE-ID 2002) discusses COPCs and recommends that the site proceed to a Track 2 investigation to ascertain the extent and concentration of potential contamination. Supporting information from the Track 1 indicated that several dirt piles are located in the area. One of the piles was found to have a concrete flap toward the bottom, possibly indicating a vault of some type. The pile with the concrete flap was incorrectly identified in the Track 1 decision document as the pile at Site MISC-45. However, a more recent examination revealed that the pile at MISC-45 has no concrete flap and is similar to numerous other dirt piles across the INL site that were excavated by backhoes. Consequently, no evidence supports the theory that the dirt pile at MISC-45 was used as a vault.

No field screening or sampling has been conducted and no sample data have been collected for this site, so the risk to human health and the environment are unknown. Therefore, sampling is necessary to fully characterize the site and evaluate its risk to human health and the environment.

#### **1.4.2 Contaminants of Potential Concern**

Because of the absence of information about contamination at Site MISC-45, COPCs include the metal by-products that could have resulted from discharging the smoke cans. This list of metals includes arsenic, aluminum, cadmium, lead, and zinc. Although the dirt pile is no longer believed to have been used as a storage vault, the potential presence of unexploded ordnance in the pile will be evaluated.

### **1.5 Abandoned Discharge Line between the TRA-608 Building and the TRA-701 Chemical Leach Pond (Site TRA-62)**

#### **1.5.1 Site Background and Description**

Site TRA-62 consists of a 12-in. vitreous clay pipeline that was used at the RTC to transport 2 million to 3 million gal of discharge water from the TRA-608 Demineralization Building to the TRA-701 chemical waste pond each year from 1952 to 1999 (Figure 1-4). The pipe is located approximately 6 to 7 ft bgs and approximately 600 ft long.

Discharge from this pipeline originated from effluent from collection headers on the west and southeast sides of the TRA-608 building and from the neutralization process in the TRA-631 Acid and Caustic Pump House. The collection header on the southeast side was not used for process effluent collection but was simply a floor drain header. This header and the 12-in. line connecting it to the TRA-62 line have been determined to be nonhazardous. The pipeline comprises a single-walled vitreous clay pipe with bell and spigot joints. This type of pipeline is generally composed of 12-ft sections that are placed together without necessarily sealing the joints, often resulting in leaks at the joints. Whether the sections of this particular pipeline were joined without sealing them is unknown, but such a configuration was common for sewer pipelines in the 1950s and 1960s, when this pipeline project was initiated.



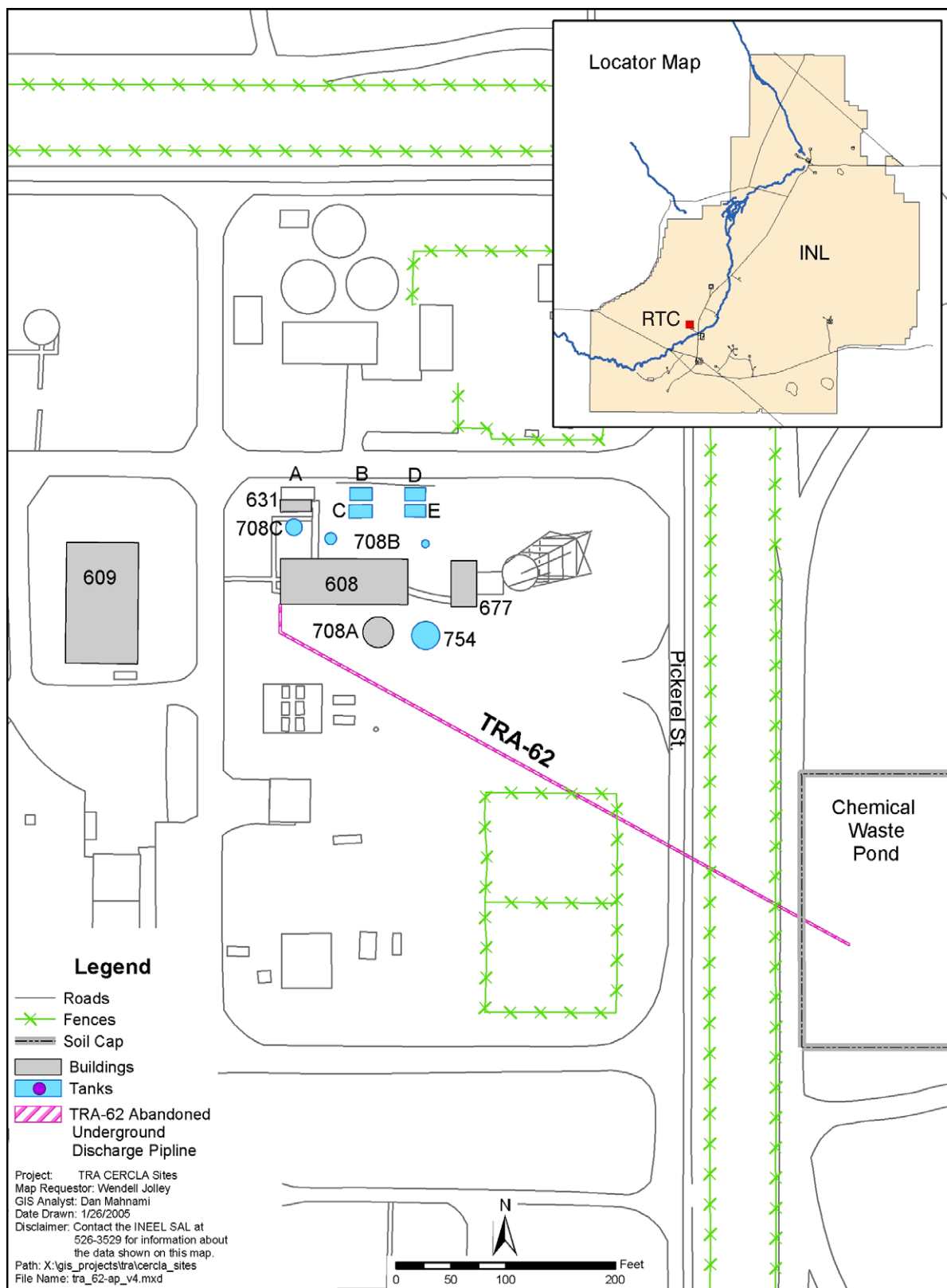


Figure 1-4. Location of the discharge pipeline between the TRA-608 Demineralization Building and the TRA-701 chemical waste pond (Site TRA-62).

No samples have been collected specifically to evaluate soil around the pipeline, but samples were collected from soil in the TRA-701 pond in 1990 and 1998. As discussed in the *Comprehensive Remedial Design/Remedial Action Work Plan for the Test Reactor Area, Operable Unit 2-13* (DOE-ID 1998), sediments collected from the TRA-701 pond in 1990 were analyzed for the metals known to be constituents of the effluent discharged to the pond as part of the demineralization process. These metals were silver, arsenic, barium, cadmium, chromium, copper, mercury, nickel, lead, selenium, and zinc. The analytical results from the 1990 sampling indicate that only barium and mercury were present above background levels in the pond sediments. Analysis of the 1998 post ROD sampling revealed that barium and mercury were present in the pond sediments at substantial levels; manganese, zinc, and arsenic were present at lower levels.

The New Site Identification Form completed for this site recommended that it be included in OU 10-08 and investigated further (Wilkinson 2002). The Track 1 decision documentation package (ICP 2004b) recommends that this site proceed to a Track 2 investigation and that soils along the length of the pipeline be sampled for metals to evaluate the risk to human health and the environment.

### **1.5.2 Contaminants of Potential Concern**

Because samples have not been collected along the pipeline, the COPCs must be inferred from chemical waste pond sampling results. Sample analysis from the chemical waste pond indicates the presence of arsenic, barium, mercury, manganese, and zinc in the TRA-701 pond. These metals are by-products of the neutralization and demineralization processes that produced the effluent carried by the pipeline. Lead is also considered a COPC, because it is a common contaminant of industrial-grade sulfuric acid.

## 2. DATA QUALITY OBJECTIVES

The data quality objective (DQO) process—as defined by *Guidance for the Data Quality Objectives Process* (EPA 2000)—is an iterative, strategic planning approach designed to ensure that the type, quality, and quantity of environmental data used in decision-making are appropriate for the intended application. The goals of the DQO process are technical adequacy (technically sound deliverables), defensibility, consistency in approach and documentation, and cost effectiveness. Once established, the DQOs are used to develop a scientific, resource-effective, data-collection design.

The DQO process specifies project decisions, the data quality required to support those decisions, specific data types needed, data-collection requirements, and analytical techniques necessary to generate the specified data quality. The process also ensures that the resources required to generate the data are justified. The DQO process consists of seven steps, and the output from each of them will influence the choices that will be made later in the process. These steps are as follows:

1. State the problem.
2. Identify the decision.
3. Identify the inputs to the decision.
4. Define the study boundaries.
5. Develop a decision rule.
6. Specify tolerable limits on decision errors.
7. Optimize the design.

During the first six steps of the process, the planning team develops decision performance criteria (i.e., DQOs) that will be used to develop the data-collection design. The final step of the process involves developing the data-collection design based on the DQOs. A brief discussion of these steps and their application to each site in this Track 2 investigation is provided below.

### 2.1 Problem Statement

The purpose of this step is to clearly and concisely state the problem to be addressed in the context of each area so that the focus of the investigation will be unambiguous. The concise problem statement describes the problem as it is currently understood and the conditions that are causing the problem. Previous studies and existing information are reviewed to gain enough of an understanding to define the problem. The appropriate outputs for this step are a concise description of the problem, a list of the planning team members, identification of the decision-maker(s), and a summary of available resources and relevant deadlines for the study. The investigation is scheduled for the summer of 2005.

#### 2.1.1 Buried Waste Pipe south of CFA-674 (Site CFA-54)

**Problem Statement:** Given that previous soil sampling indicates that contamination is present in the soil along the pipeline, a phased approach should be used to (1) determine whether there have been obvious releases from the pipe and whether their locations can be identified and (2) determine the true mean of contaminants along the pipeline for input into a risk assessment to ascertain the potential risks to human health and the environment.

### **2.1.2 Dirt Pile with Naval Smoke Cans near INTEC (Site MISC-45)**

**Problem Statement:** Site MISC-45 consists of two separate components: (1) empty naval smoke canisters and (2) the dirt pile. Given that metal by-products are generated from the release of smoke from the canisters, characterization data will be collected from the soil around the smoke cans to ascertain the risks to human health and the environment. In addition, because the purpose and past use of the dirt pile is unknown, geophysical techniques (a total field magnetometer) will be used to evaluate the presence or absence of unexploded ordnance within the dirt pile.

### **2.1.3 Abandoned Discharge Pipeline between the TRA-608 Building and the TRA-701 Chemical Waste Pond (Site TRA-62)**

**Problem Statement:** Because it is unknown whether contamination has been released to the environment from the pipeline, a phased approach should be used to (1) ascertain whether there have been obvious releases from the pipe and whether their locations can be identified and (2) determine the true mean of contaminants along the pipeline for input into a risk assessment to ascertain the potential risk to human health and the environment.

## **2.2 Decision Identification**

The primary objective of this step is to develop accurate and comprehensive decision statements (DSs) that address the concerns highlighted in the problem statements. This objective includes identifying the questions that the study will attempt to resolve and the actions that could result or be affected by the data collected. This is done by specifying a principal study question (PSQ), identifying alternative actions (AAs) that could result from resolution of the PSQ, and combining the PSQ and AAs into a DS.

### **2.2.1 Buried Waste Pipe south of CFA-674 (Site CFA-54)**

The objective of sampling the soil below the pipeline at Site CFA-54 will be to answer the following question:

- PSQ: Based on the 95% upper confidence limit (UCL) or the maximum concentration, does the soil beneath the pipeline contain concentrations of mercury, aroclor-1254, arsenic, Cs-137, U-234, U-235, or U-238 that pose an unacceptable risk to human health or the environment?

The AAs to be taken, depending on the resolution to the PSQ, are as follows:

- AA1: Further evaluation is required to ascertain the most appropriate action to be taken at this site if, based on the 95% UCL or the maximum concentration, analytical laboratory results from soil sampling show that the soil beneath the pipeline contains concentrations of mercury, aroclor-1254, arsenic, Cs-137, U-234, U-235, or U-238 that pose an unacceptable risk to human health or the environment.
- AA2: No further action is required at this site if, based on the UCL or the maximum concentration, analytical laboratory results from soil sampling show that the soil beneath the pipeline does not contain concentrations of mercury, aroclor-1254, arsenic, Cs-137, U-234, U-235, or U-238 that pose an unacceptable risk to human health or the environment.

Combining the PSQ and the AAs results in the following DS:

- Based on the 95% UCL or maximum concentration, ascertain whether the soil beneath the pipeline contains concentrations of mercury, aroclor-1254, arsenic, Cs-137, U-234, U-235, or U-238 that pose an unacceptable risk to human health or the environment.

### **2.2.2 Dirt Pile with Naval Smoke Cans near INTEC (Site MISC-45)**

The objective of conducting a scan of the dirt pile using a magnetometer and sampling the surface soil around the naval smoke cans will be to answer the following question:

- PSQ: Based on the 95% UCL or the maximum concentration, does the soil contain aluminum, arsenic, cadmium, lead, or zinc at levels that pose an unacceptable risk to human health or the environment, and is ordnance present within the dirt pile?

The AAs to be taken, depending on the resolution to the PSQ, are as follows:

- AA1: The soil will be removed and disposed of properly if, based on the 95% UCL or the maximum concentration, the soil around the smoke cans contains aluminum, arsenic, cadmium, lead, or zinc at levels that pose an unacceptable risk to human health or the environment. If the dirt pile contains ordnance, further evaluation will be required to ascertain the most appropriate action to be taken at the site.
- AA2: No further action is required at this site if, based on the 95% UCL or maximum concentration, the soil around the smoke cans does not contain aluminum, arsenic, cadmium, lead, or zinc at concentrations that pose an unacceptable risk to human health or the environment and if the pile does not contain ordnance.

Combining the PSQ and the AAs results in the following DS:

- Based on the 95% UCL or maximum concentration, ascertain whether the soil around the smoke cans contains aluminum, arsenic, cadmium, lead, or zinc at levels that pose an unacceptable risk to human health or the environment, and ascertain whether the dirt pile contains ordnance.

### **2.2.3 Abandoned Discharge Pipeline between the TRA-608 Building and the TRA-701 Chemical Waste Pond (Site TRA-62)**

The objective of sampling the soil at Site TRA-62 will be to answer the following question:

- PSQ: Based on the 95% UCL or maximum concentration, does the soil beneath the pipe at Site TRA-62 contain arsenic, barium, lead, manganese, mercury, or zinc at levels that pose an unacceptable risk to human health or the environment?

The AAs to be taken, depending on the resolution to the PSQ, are as follows:

- AA1: Further evaluation is required to ascertain the most appropriate action to be taken at Site TRA-62 if, based on the 95% UCL or maximum concentration, the soil the site contains arsenic, barium, lead, manganese, mercury, or zinc at levels that pose an unacceptable risk to human health or the environment.

- AA2: No further action is required at Site TRA-62 if, based on the 95% UCL or maximum concentration, the soil at Site TRA-62 does not contain arsenic, barium, lead, manganese, mercury, or zinc at levels that pose an unacceptable risk to human health or the environment.

Combining the PSQ and the AAs results in the following DS:

- Based on the 95% UCL or maximum concentration, ascertain whether the soil at Site TRA-62 contains arsenic, barium, lead, manganese, mercury, or zinc at levels that pose an unacceptable risk to human health or the environment.

## 2.3 Decision Inputs

The purpose of the decision inputs step is to identify the type of data needed to resolve each of the DSs identified in decision identification step. Identification and quantification of hazardous constituents at Sites CFA-54, MISC-45, and TRA-62 are needed to resolve the DSs listed above. The available preliminary data for the concentrations of hazardous constituents in the soil at Site CFA-54 are relevant to this investigation, because they indicate the presence of elevated mercury. However, the existing data are insufficient to ascertain the extent of soil contamination at this site. Data are not currently available from Sites MISC-45 or TRA-62.

During this step of the DQO process, the basis for an action level is established. The action level is the threshold value that provides the criterion for choosing between AAs. Action levels can be based on regulatory thresholds or standards, or they can be derived from problem-specific considerations such as risk analysis.

### 2.3.1 Buried Waste Pipe South of CFA-674 (Site CFA-54)

To resolve the DS for Site CFA-54, a two-phased approach will be used. Phase one will be to expose the ends of the pipe, then send a remotely operated camera through the pipe to ensure that the line is straight, determine the locations of joints, and identify the most likely locations of leaks. Phase two will be to collect a group of random samples from the 0- to 6-in. zone just below the pipe. In addition, based on the video information, biased auguring locations will be selected beneath the pipe to target locations where the pipe was likely to leak. Sampling is described in detail in Section 3. The samples will be analyzed for mercury, aroclor-1254, arsenic, Cs-137, U-234, U-235, and U-238 to ascertain whether they are in the soil at concentrations that could result in a cancer risk of greater than  $10^{-4}$  or a hazard index of greater than 1 due to the ingestion, inhalation, or dermal absorption pathways.

### 2.3.2 Dirt Pile with Naval Smoke Cans near INTEC (Site MISC-45)

To resolve the DS for Site MISC-45, three multi-increment soil samples will be collected and analyzed from around the smoke cans to evaluate whether the contamination is present in the soil around the cans. The samples will be analyzed for aluminum, arsenic, cadmium, lead, and zinc to ascertain whether these constituents are in the soil at concentrations that could result in a cancer risk of greater than  $10^{-4}$  or a hazard index of greater than 1 due to the ingestion, inhalation, and dermal absorption pathways. Additionally, the dirt pile will be surveyed with two total field magnetometers to ascertain whether ordnance might be present within the dirt pile. Sampling is described in detail in Section 3.

### **2.3.3 Abandoned Discharge Pipeline between the TRA-608 Building and the TRA-701 Chemical Waste Pond (Site TRA-62)**

To resolve the DS for Site TRA-62, a two-phased approach will be used. Phase one will be to expose the ends and middle of the pipe, then send a remotely operated camera through the pipe to ensure that the line is straight, determine the locations of joints, and identify the most likely locations of leaks. Phase two will be to collect a group of random samples from the 0- to 6-in. zone just below the pipe. Additionally, based on the video information, biased sampling locations will be selected beneath the pipe to target locations where the pipe was likely to leak. Samples will be analyzed for arsenic, barium, lead, manganese, mercury, and zinc to ascertain whether they are in the soil at concentrations that could result in a cancer risk of greater than  $10^{-4}$  or a hazard index of greater than 1 due to the ingestion, inhalation, and dermal absorption pathways. Sampling is described in detail in Section 3.

## **2.4 Study Boundaries**

The purpose of this step is to define the spatial and temporal boundaries of the sample domain. The spatial boundaries simply define the physical extent of the study area and can be subdivided into specific areas of interest. The temporal boundaries define the duration of the study or specific parts of the study. The outputs of this step are a detailed description of the spatial and temporal boundaries of the problem and a discussion of any practical constraints that could interfere with the study.

### **2.4.1 Buried Waste Pipe south of CFA-674 (Site CFA-54)**

The spatial boundaries of concern at Site CFA-54 consist of the potentially contaminated soil material beneath the buried pipeline down to 10 ft bgs or to basalt, whichever is encountered first. The characteristics that define the population of interest are the concentrations of mercury, aroclor-1254, arsenic, Cs-137, U-234, U-235, and U-238 in the soil volume identified. The schedule for project activities is specified in the *Scope of Work for Waste Area Group 10 Track 2 Investigations for Sites CFA-54, MISC-45, and TRA-62* (DOE-ID 2005a).

### **2.4.2 Dirt Pile with Naval Smoke Cans near INTEC (Site MISC-45)**

The spatial boundaries of concern at Site MISC-45 are confined to the soil surrounding the smoke cans and anomalies within the dirt pile. The characteristics that define the population of interest are either (a) the contaminant concentrations of aluminum, arsenic, cadmium, lead, and zinc in the soil volume identified or (b) the presence of anomalies within the dirt pile. The schedule for project activities is specified in the *Scope of Work for Waste Area Group 10 Track 2 Investigations for Sites CFA-54, MISC-45, and TRA-62* (DOE-ID 2005a).

### **2.4.3 Abandoned Discharge Pipeline between the TRA-608 Building and the TRA-701 Chemical Waste Pond (Site TRA-62)**

The spatial boundaries of concern at Site TRA-62 consist of the soil beneath and immediately surrounding the buried pipeline between the TRA-608 building and the TRA-701 chemical waste pond. The characteristics that define the population of interest are the concentrations of arsenic, barium, lead, manganese, mercury, and zinc in the soil volume identified. The schedule for project activities is specified in the *Scope of Work for Waste Area Group 10 Track 2 Investigations for Sites CFA-54, MISC-45, and TRA-62* (DOE-ID 2005a).

## 2.5 Decision Rule

The purpose of this step is to define the statistical parameters of interest, specify action levels, and integrate any previous DQO inputs into a single statement that describes a logical basis for choosing among AAs.

The decision rule is an “if/then” statement that describes the action to take if one or more conditions are met. The decision rule also combines the parameter of interest, the scale of decision-making, the action level, and the action(s) that would result from resolution of the decision.

### 2.5.1 Buried Waste Pipe South of CFA-674 (Site CFA-54)

The decision rules associated with Site CFA-54 are described below:

- **If** analytical laboratory results from soil sampling show that the soil beneath the buried waste pipe contains mercury, aroclor-1254, arsenic, Cs-137, U-234, U-235, or U-238 at concentrations that pose an unacceptable risk to human health or the environment based on the 95% UCL of the mean or the maximum concentration, **then** further evaluation is required to ascertain the most appropriate action to be taken at this site.
- **If** analytical laboratory results from soil sampling show that the soil beneath the buried waste pipe does not contain mercury, aroclor-1254, arsenic, Cs-137, U-234, U-235, or U-238 at concentrations that pose an unacceptable risk to human health or the environment, **then** no further action is required at this site.

### 2.5.2 Dirt Pile and Naval Smoke Cans near INTEC (Site MISC-45)

The decision rules associated with Site MISC-45 are described below:

- **If** analytical laboratory results from the soil around the smoke cans show that the concentrations of aluminum, arsenic, cadmium, lead, or zinc pose an unacceptable risk to human health or the environment based on the 95% UCL of the mean or the maximum concentration, or if anomalies exist within the dirt pile, **then** further evaluation is required to ascertain the most appropriate action to be taken at this site.
- **If** the soil around the smoke cans does not contain contaminants at concentrations that pose an unacceptable risk to human health or the environment, and if no anomalies exist within the dirt pile, **then** no further action is required at this site.

### 2.5.3 Abandoned Discharge Pipeline between the TRA-608 Building and the TRA-701 Chemical Waste Pond (Site TRA-62)

The decision rules associated with Site TRA-62 are described below:

- **If** the soil at Site TRA-62 contains arsenic, barium, manganese, mercury, lead, or zinc at concentrations that pose an unacceptable risk to human health or the environment based on the 95% UCL of the mean or the maximum concentration, **then** further evaluation is required to ascertain the most appropriate action to be taken at this site.



- **If** the soil at Site TRA-62 does not contain arsenic, barium, manganese, mercury, lead, or zinc at concentrations that pose an unacceptable risk to human health or the environment, **then** no further action is required at this site.

## 2.6 Decision Error Limits

Because analytical data can only provide an estimate of the condition of a site, decisions that are based on such data could be erroneous. The purpose of this step is to minimize uncertainty in the data by defining tolerable limits on decision errors that are used to establish performance goals for the data-collection design.

The decision-maker must define acceptable limits on the probability of making a decision error. The possibility of decision error cannot be eliminated, but controlling the total study error can minimize it. Methods for controlling total study error include collecting a sufficient number of samples (to control sampling design error), analyzing individual samples several times, or using more precise analytical methods (to control measurement error). Therefore, it is necessary to determine the possible range for the parameter of interest and to define the types of decision errors and the potential consequences of the errors.

### 2.6.1 Buried Waste Pipe South of CFA-674 (Site CFA-54)

The two types of decision errors that could occur with regard to Site CFA-54 are as follows:

- Ascertaining that mercury, aroclor-1254, arsenic, Cs-137, U-234, U-235, or U-238 is in the soil beneath the buried pipeline at concentrations that could result in a cancer risk greater than  $10^{-4}$  or a hazard index of greater than 1 from the ingestion, inhalation, and dermal absorption pathways when in fact it is not, resulting in the collection of unnecessary additional samples to characterize the materials. This would result in further expenditure of project resources to complete unnecessary activities and might generate waste in the form of unnecessary removal activities.
- Ascertaining that mercury, aroclor-1254, arsenic, Cs-137, U-234, U-235, or U-238 is not in the soil beneath the buried pipeline at concentrations that could result in a cancer risk greater than  $10^{-4}$  or a hazard index of greater than 1 from the ingestion, inhalation, and dermal absorption pathways when in fact it is, resulting in the assumption that no further action is required at the site. This could result in CERCLA compliance issues and failure to protect human health and the environment.

Given the two possible errors, the following null hypothesis was developed:

- The cumulative soil concentrations exceed the  $1 \times 10^{-4}$  carcinogenic goal or non-carcinogenic hazard index of 1 for the current worker and the future worker and resident or a hazard index of 10 for ecological receptors, as determined using the 95% UCL of the mean or the maximum concentration.

### 2.6.2 Dirt Pile and Naval Smoke Cans near INTEC (Site MISC-45)

The two types of decision errors that could occur with regard to Site MISC-45 are as follows:

- Ascertaining that anomalies exist in the dirt pile or that arsenic, aluminum, cadmium, lead, or zinc is in the soil around the smoke cans at concentrations that could result in a cancer risk greater than  $10^{-4}$  or a hazard index of greater than 1 from the ingestion, inhalation, and dermal absorption

pathways when in fact it is not, resulting in the collection of unnecessary additional samples to characterize the materials, expenditure of project resources to complete unnecessary activities, and potential generation of waste in the form of unnecessary removal activities.

- Ascertaining that anomalies do not exist in the dirt pile or that arsenic, aluminum, cadmium, lead, or zinc is not present in the soil around the smoke cans at concentrations that could result in a cancer risk greater than  $10^{-4}$  or a hazard index of greater than 1 from the ingestion, inhalation, and dermal absorption pathways when in fact it is, resulting in the assumption that no further action is required at the site. This could result in CERCLA compliance issues and failure to protect human health and the environment.

Given the two possible errors, the following null hypothesis was developed:

- The cumulative soil concentrations exceed the  $1 \times 10^{-4}$  carcinogenic goal or non-carcinogenic hazard index of 1 for the current worker and the future worker and resident or a hazard index of 10 for ecological receptors, as determined using the 95% UCL of the mean or the maximum concentration.

### **2.6.3 Abandoned Discharge Pipeline between the TRA-608 Building and the TRA-701 Chemical Waste Pond (Site TRA-62)**

The two types of decision errors that could occur with regard to Site TRA-62 are as follows:

- Ascertaining that arsenic, barium, lead, manganese, mercury, or zinc is in the soil beneath the pipeline at concentrations that could result in a cancer risk greater than  $10^{-4}$  or a hazard index of greater than 1 from the ingestion, inhalation, and dermal absorption pathways when in fact it is not, resulting in the collection of unnecessary samples to characterize the materials, further expenditure of project resources to complete unnecessary activities, and potential generation of unnecessary waste in the form of unnecessary removal activities.
- Ascertaining that arsenic, barium, lead, manganese, mercury, or zinc is not present in the soil beneath the pipeline at concentrations that could result in a cancer risk greater than  $10^{-4}$  or a hazard index of greater than 1 from the ingestion, inhalation, and dermal absorption pathways when in fact they do, resulting in the assumption that no further action is required at the site. This could result in CERCLA compliance issues and failure to protect human health and the environment.

Given the two possible errors, the following null hypothesis was developed:

- The cumulative soil concentrations exceed the  $1 \times 10^{-4}$  carcinogenic goal or non-carcinogenic hazard index of 1 for the current worker and the future worker and resident or a hazard index of 10 for ecological receptors, as determined using the 95% UCL of the mean of the maximum concentration.

## **2.7 Design Optimization**

The purpose of design optimization in the DQO process is to evaluate information from the previous steps, generate alternative data-collection design options that will provide the data needed for the desired analysis, and select the most resource-effective design that meets all DQOs. The activities involved in design optimization include the following:

- Review the outputs of the first six steps and existing environmental data.

- Develop general data-collection design alternatives.
- Formulate a mathematical expression needed to solve the design problem for each data-collection design alternative.
- Select the optimal number of samples to satisfy the DQOs for each data-collection design alternative.
- Select the most resource-effective data-collection design that satisfies all of the DQOs.

After these activities are completed, the operational details and theoretical assumptions of the selected design are documented in the FSP. Several designs were considered during the development of this FSP. The details proposed in Section 3 are the designs projected to meet project resource availability while satisfying the DQOs.

### 2.7.1 Buried Waste Pipe south of CFA-674 (Site CFA-54)

To ensure the most resource-effective data-collection design, the mathematical formula presented in Equation (2-1) was used to select the number of samples that will be required to produce an average contaminant concentration for the area under the pipe. These data will be used to ascertain the risk to human health and the environment.

$$n_d = \frac{t^2 s^2}{e^2} \quad (2-1)$$

where

- $n_d$  = number of samples
- $t$  = false positive
- $s$  = standard deviation
- $e$  = tolerable error in mg/kg when estimating the mean.

A 90% false positive measurement means that there is a 90% chance that the true mean will not exceed the upper bound. The standard deviation used in the sample size calculation is estimated as 1/6 of the measurement range. The range is the high value minus the low value. The high value measured along the pipe is 73 mg/kg, and the low value is zero. The tolerable error is the value that is considered acceptable in establishing the true mean. The value for the tolerable error is 5 mg/kg. Substituting these into the above equation yields Equation (2-2):

$$n_d = \frac{(1.282)^2 \left( \frac{73 \text{ mg/kg}}{6} \right)^2}{(5 \text{ mg/kg})^2} \quad (2-2)$$

Which reduces further to that shown in Equation (2-3):

$$n_d = \frac{(1.64)(12.166667)^2}{25} \quad (2-3)$$

The parameters of the selected statistical design for soil that provide the most resource-effective data-collection design are summarized as follows:

- Samples will be collected on a random basis.
- The statistical test of interest is a comparison of the 95% UCL to the remedial action goal.
- The false-positive (  $\alpha$  ) error rate is 10% (  $Z_{1-\alpha} = 1.282$  ).

Therefore, the calculated number of samples is shown in Equation (2-4):

$$n_d = \frac{(1.64)(148.027778)}{25} = 9.71 \cong 10 \quad . \quad (2-4)$$

### 2.7.2 Dirt Pile and Naval Smoke Cans near INTEC (Site MISC-45)

The sampling design for Site MISC-45 is not based on a statistical formula. Because the sampling area is small (approximately 15 ft × 15 ft) and based on recommendations from the Idaho Department of Environmental Quality, a multi-increment sampling scheme will be followed. This approach will divide the area surrounding the smoke cans into a 30-increment grid, and three multi-increment samples will be collected. Three 2-oz scoops will be collected from each grid, and each scoop will be placed in one of three collection bowls. The total volume of all of the scoops in each bowl will be mixed together. Then this material will be used to fill the sample jars for analysis. The two additional multi-increment samples are to add validity to the results.

### 2.7.3 Abandoned Discharge Pipeline between the TRA-608 Building and the TRA-701 Chemical Waste Pond (Site TRA-62)

The statistically based sampling design for Site TRA-62 will be implemented to determine the number of samples that will be required to produce an average contaminant concentration for the area under the pipe. The average contaminant concentration will be used to determine risk to human health and the environment. The number of samples is determined using the following formula:

$$n_d = \frac{t^2 s^2}{e^2} \quad (2-5)$$

where

- $n_d$  = number of samples
- $t$  = false positive
- $s$  = standard deviation
- $e$  = tolerable error in mg/kg when estimating the mean.

A 90% false positive measurement means that there is a 90% chance that the true mean will not exceed the upper bound. The standard deviation used in the sample size calculation is estimated as 1/6 of the measurement range. The range is the high value minus the low value. The high value measured in the TRA-06 pond is 133 mg/kg, and the low value is zero. The tolerable error is the value that is considered

acceptable in establishing the true mean. The value for the tolerable error is 9 mg/kg. Substituting these into the above equation yields Equation (2-6):

$$n_d = \frac{(1.282)^2 \left( \frac{133 \text{ mg / kg}}{6} \right)^2}{(9 \text{ mg / kg})^2} . \quad (2-6)$$

Which reduces further to that shown in Equation (2-7):

$$n_d = \frac{(1.64)(22.166667)^2}{81} . \quad (2-7)$$

The parameters of this equation are summarized as follows:

- Samples will be collected on a random basis.
- The statistical test of interest is a comparison of the 95% UCL to the remedial action goal.
- The false-positive (  $\alpha$  ) error rate is 10% (  $Z_{1-\alpha} = 1.282$  ).

Therefore, the number of confirmation samples is calculated as shown in Equation (2-8):

$$n_d = \frac{(1.64)(491.3611)}{81} = 9.94 \cong 10 . \quad (2-8)$$



### 3. SAMPLE LOCATION

This section presents the sampling locations for each of the three CERCLA sites in this Track 2 investigation.

#### 3.1 Buried Waste Pipe south of CFA-674 (Site CFA-54)

Collection of at least 10 soil samples from beneath the buried waste pipe at Site CFA-54 is planned in order to ascertain the presence and concentration of COPCs. Before samples are collected, the ends of the pipe will be excavated, and a video camera will be run through the pipe to find locations where leakage is most likely to have occurred. Ten sample locations along the length of the pipeline will be selected randomly. In addition, biased samples that coincide with the locations of joints or breaks along the length of the pipeline will also be collected. Using a hollow-stem auger and split-spoon, samples will be obtained from the soil below the pipe at each of the sampling locations.

During the remedial-action soil excavation at the CFA-04 pond, the depth to basalt in the pond was measured and mapped. As discussed in the *Assessment of Buried Asbestos-Containing Roofing Materials and Depth to Basalt Geophysical Survey at the CFA-04 Pond* (Clements et al. 2001), the depth to basalt in the pond varies from about 3 to 17 ft bgs. Therefore, samples will be targeted for the 0- to 1-ft zone beneath the pipe. A Zeeman Mercury Analyzer RA-915+ equipped with an RP-91C pyrolysis attachment will be used for sample screening. This mercury analyzer has a detection limit of 0.5 µg/kg for mercury in soils and sediments and has an error limit of 30%. In the borings where the mercury concentration exceeds 0.5 mg/kg, additional samples will be collected at 2-ft intervals down to 10 ft bgs or until basalt is encountered. The 0.5-mg/kg mercury concentration is the original cleanup goal for mercury at the CFA-04 pond site (DOE-ID 2000). This concentration is based on a mercury concentration of 10 times the INL site background concentration. All samples that exceed 0.5 mg/kg for mercury will be shipped to the laboratory and analyzed for the complete list of COPCs. In addition, 20% of the samples with mercury concentrations below 0.5 mg/kg will be sent to the laboratory and analyzed for the complete list of COPCs.

Approximate sampling locations at Site CFA-54 are illustrated in Figure 3-1; actual sampling locations will be determined after the subsurface investigation and the video examination of the inside of the pipe. The exact location of each sampling point will be measured and recorded using a known reference point, a Global Positioning System, or standard surveying techniques.

#### 3.2 Dirt Pile and Naval Smoke Cans near INTEC (MISC-45)

To satisfy DQO requirements, multi-increment soil samples will be collected from around the smoke cans at Site MISC-45 (Figure 3-2). Three sets of multi-increment soil samples and one duplicate sample will be collected from the area around the smoke cans, and the samples will be analyzed for the COPCs. Three 2-oz scoops of surface soil will be collected from the ground surface in each grid. Sample collection will begin with the perimeter grids, work concentrically inward, and finish with the innermost grids. This will allow the sampler to use the same spoon to collect all of the scoops. Each bowl will have its own mixing and sample-collection spoon. When soil from each grid has been collected, the soil will be mixed, and sample jars will be filled. Soil samples will be sent to an off-site laboratory and analyzed for the identified list of COPCs.

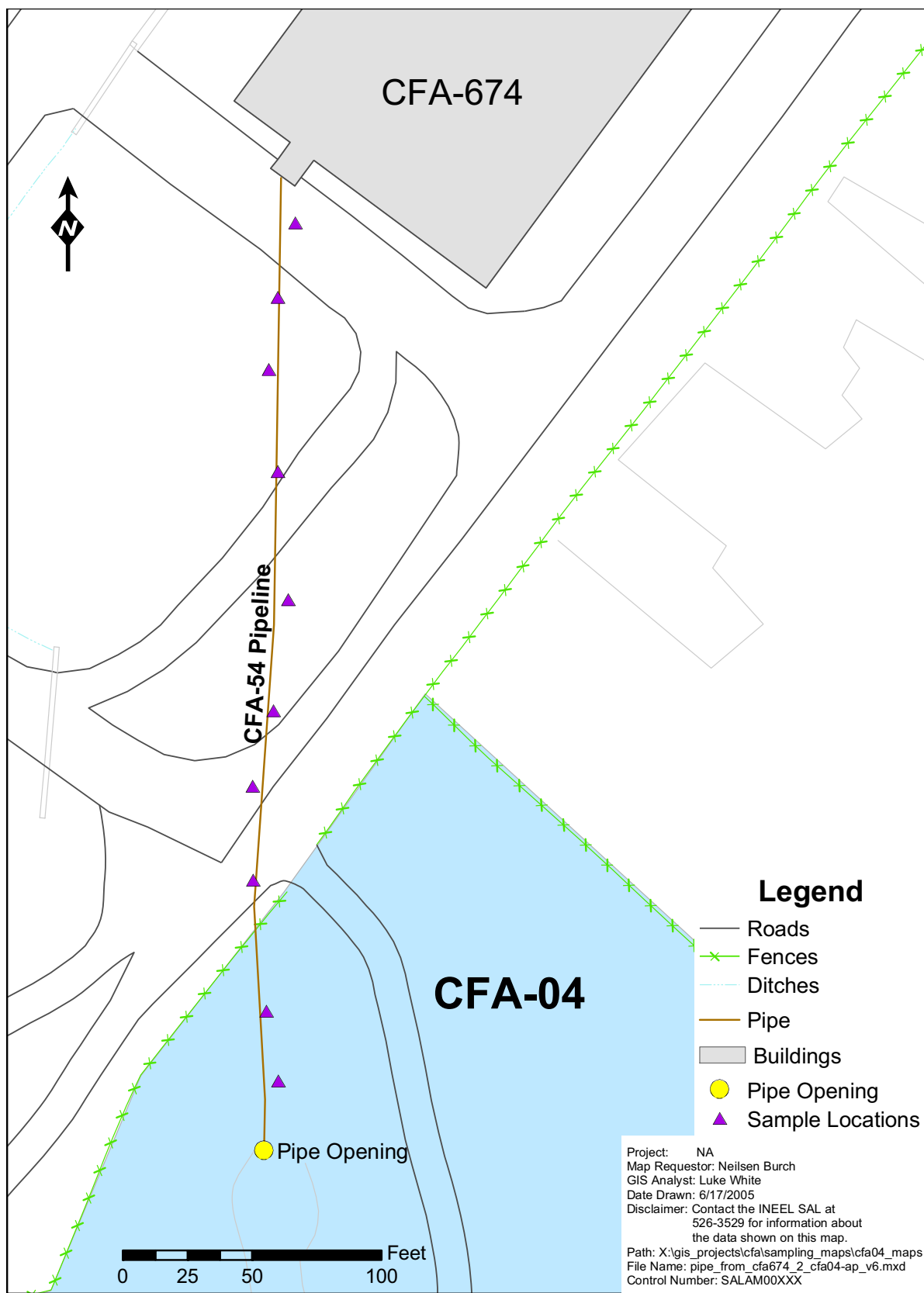


Figure 3-1. Approximate sampling locations at Site CFA-54.



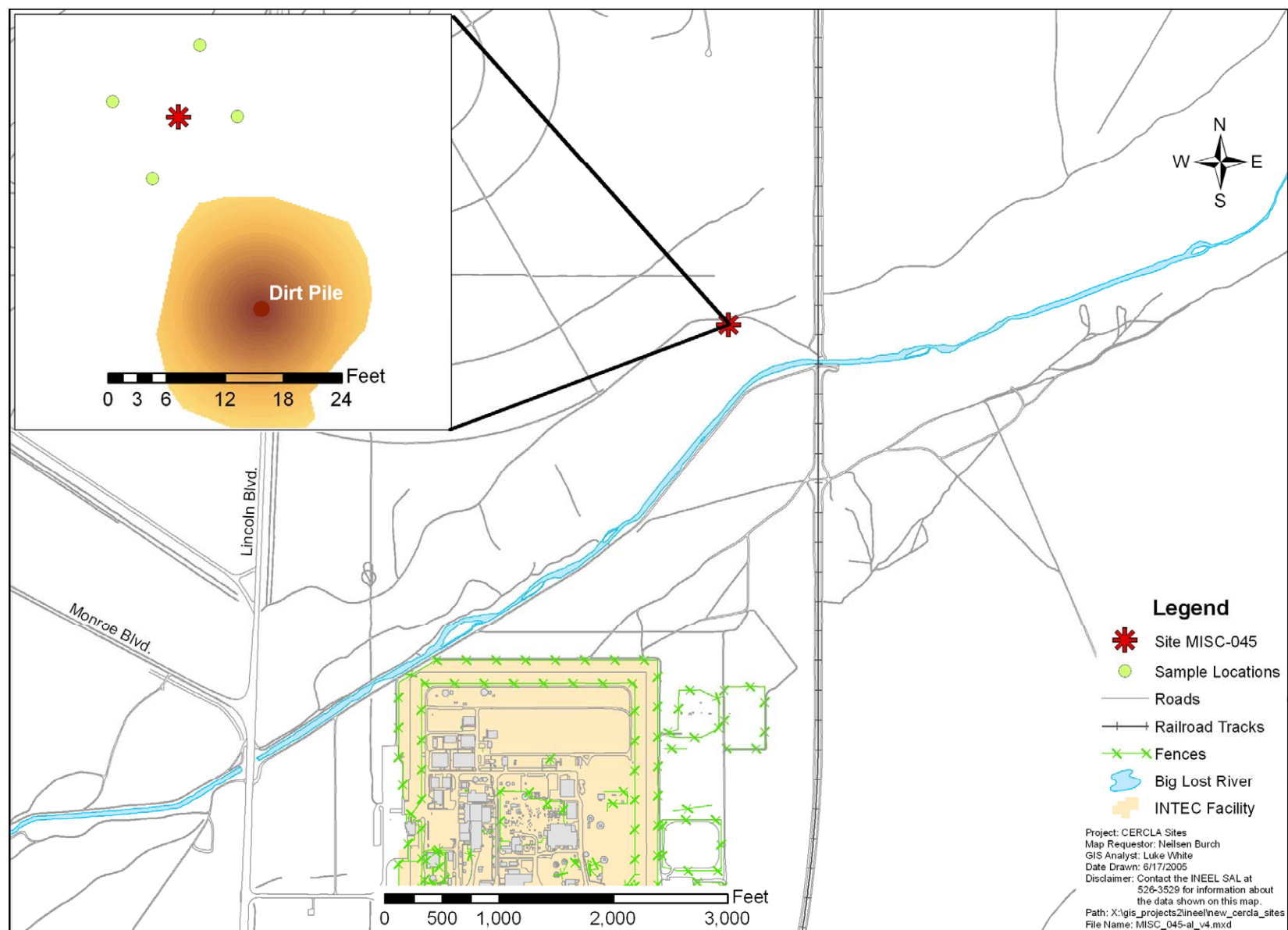


Figure 3-2. Sampling locations at Site MISC-45.

The dirt pile will be swept with two total field magnetometers to yield the gradient of the magnetic field. Ordnance and other metallic objects will appear as anomalies in the magnetic field. The smallest size ordnance discovered at the INL site is a 3- × 10.35-in. projectile that weighs 13.1 lbs. The explosive material inside the projectile weighs 0.3 lbs. The total field magnetometer can detect and locate this size of object to a depth just in excess of 10 ft bgs. If anomalies are encountered in the dirt pile, additional actions will need to be developed.

### **3.3 Abandoned Discharge Pipeline between the TRA-608 Building and the TRA-701 Chemical Waste Pond (Site TRA-62)**

Soil beneath the pipeline at Site TRA-62 will be sampled to satisfy DQO requirements (Figure 3-3). Collection of a total of 10 random soil borings by means of hollow-stem auger and split-spoon sampling is planned. Before sampling begins, the pipe will be excavated near each end and near its middle to identify the exact location of the pipe. From these three locations, the other sampling locations will be established based on a straight line between the excavated locations. The borings will be located as close to the pipeline as possible, and samples will be collected from the 0- to 1-ft interval just below the bottom of the pipe. The samples will be screened using a Zeeman Mercury Analyzer RA-915+ equipped with an RP-91C pyrolysis attachment. In the borings where the mercury concentration exceeds 0.5 mg/kg, additional samples will be collected from 4-ft intervals until the mercury concentration drops below 0.5 mg/kg or until basalt is encountered, whichever occurs first (basalt is estimated at approximately 45 ft bgs). All samples that exceed 0.5 mg/kg for mercury will be shipped to the laboratory and analyzed for the complete list of COPCs. In addition, 20% of the samples with mercury concentrations below 0.5 mg/kg will be sent to the laboratory and analyzed for the complete list of COPCs.

Subsurface obstructions such as buried utility lines and pipes could pose problems at sampling locations. Therefore, a subsurface investigation will be conducted to locate potential subsurface obstructions before fieldwork begins. Sampling locations will be chosen such that any obstructions identified during the subsurface investigation will be avoided. After the final sampling locations are identified, the positions will be measured and recorded using a known reference point, a Global Positioning System, or standard surveying techniques.

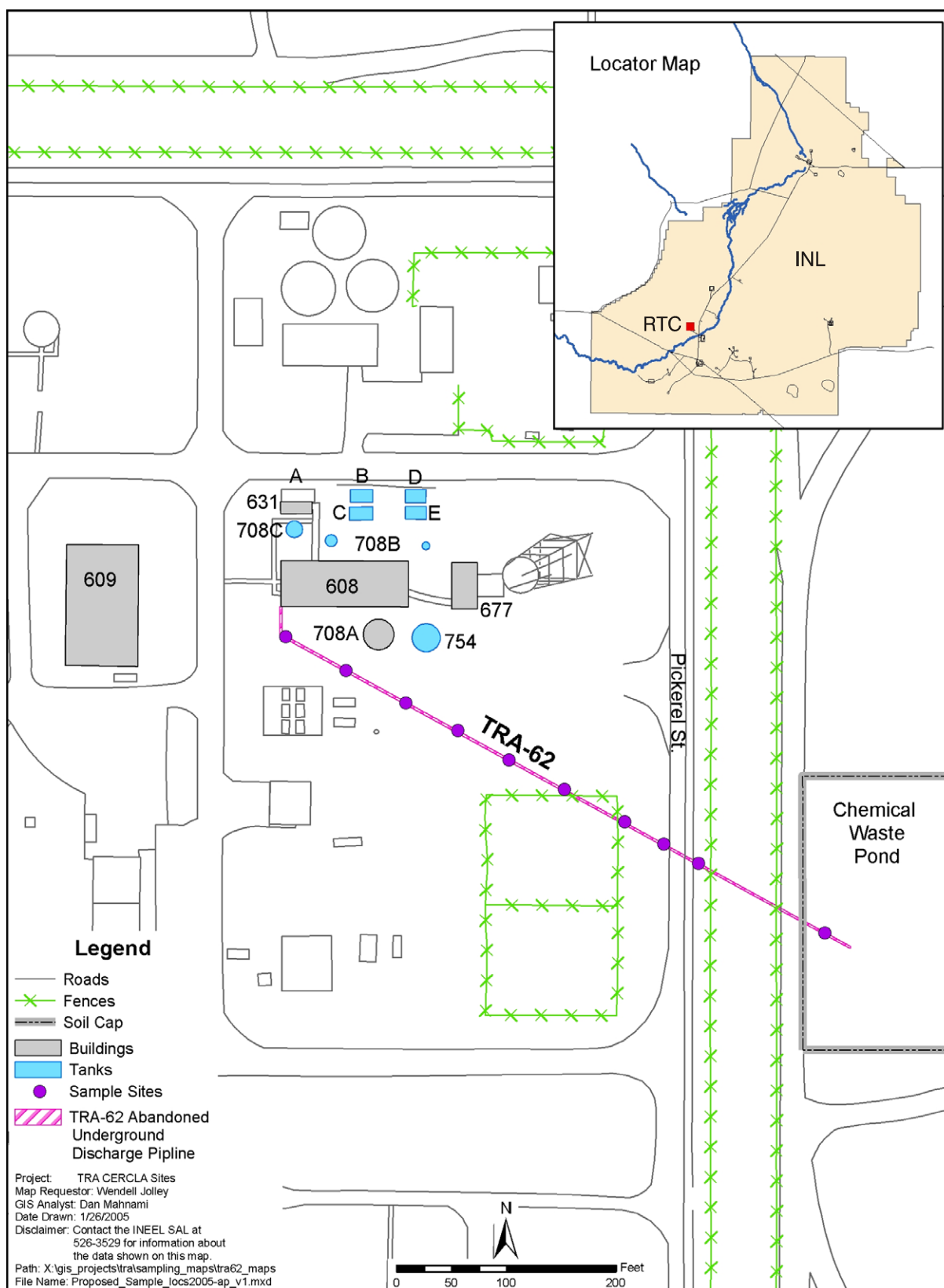


Figure 3-3. Sampling locations at Site TRA-62.



## **4. SAMPLE EQUIPMENT AND DOCUMENTATION**

### **4.1 Sample Equipment and Supplies**

The following is a list of sample equipment and supplies compiled using guidance outlined in Management Control Procedure (MCP)-3480, “Environmental Instructions for Facilities, Processes, Materials, and Equipment.” Although exhaustive, this list should be used only as a guide. Safety equipment and supplies are not included in this list. Those items will be listed in the project-specific health and safety plan.

- Sample labels and custody seals
- “ER Program Chain of Custody Forms” (Form 435.20)
- Radiological properties labels (if required)
- Insulated sample coolers
- Reusable ice packs or dry ice
- Bubble wrap
- Laboratory-prepared trip blanks (if volatile organic compounds are parameters of interest)
- U.S. Department of Energy material hazard labels
- Plastic strapping tape
- Re-sealable plastic bags
- Plastic garbage bags
- Duct tape
- Address labels
- “THIS SIDE UP” labels
- Indelible marking pens
- Scissors or knife
- “Requests for Shipments/Transfer of Property” (Form 460.01)
- Shipping document forms
- Sample/shipping logbooks.

### **4.2 Sample Designation**

The Sample and Analysis Management (SAM) Program has assigned a unique 10-character identifier for each sample collected during this Track 2 investigation. The first three characters are either TRA or CFA. The fourth, fifth, sixth, seventh, and eighth characters identify the sample location and the sequence of sampling (if collocated duplicates are taken from a single location). The ninth and tenth characters identify the type of analyses being performed on that sample. If additional samples are collected in the field, the field team leader (FTL) must ensure that the identification scheme described in this section is used.

### **4.3 Sample Documentation and Management**

The FTL will control and maintain all field documents and records and submit the required documents to the Administrative Record and Document Control Office at the conclusion of the project. Sample-documentation, shipping, and custody procedures for this project are based on U.S. Environmental Protection Agency (EPA)-recommended procedures that emphasize careful documentation of sample collection and transfer. The appropriate information pertaining to each sample will be recorded in accordance with MCP-1194, “Logbook Practices for ER and D&D&D Projects,” and the QAPjP (DOE-ID 2004a). The person designated to complete the sample or FTL logbook will record information such as pre-sampling safety meeting notes, weather conditions, and general project notes, as appropriate. Proper handling, management, and disposal of samples under the control of the INL management and operations contractor, or subcontractors, are essential. All personnel involved with handling, managing, or disposing of samples will be trained in accordance with MCP-3480, “Environmental Instructions for Facilities, Processes, Materials, and Equipment,” and Program Requirements Document (PRD)-5030, “Environmental Requirements for Facilities, Processes, Materials, and Equipment,” and all samples will be dispositioned in accordance with MCP-3480 and PRD-5030.

If it becomes necessary to revise these documents, a Document Action Request (Form 412.11) will be executed in accordance with MCP-233, “Process for Developing, Releasing, and Distributing ER Documents (Supplemental to MCP-135 & MCP-9395).” Document Action Requests could include additional analyses that are needed to meet appropriate waste acceptance criteria.

## 5. SAMPLE HANDLING AND ANALYSIS, WASTE DISPOSAL, AND WASTE MINIMIZATION

### 5.1 Sample Handling and Analysis

Samples will be handled in accordance with the QAPjP (DOE-ID 2004a). The maximum sample holding times for each analytical parameter are presented in the QAPjP. Careful coordination of sampling and shipping among the SAM Program, the FTL, and the laboratory project manager is required to ensure that holding times are met. The analyses required for this project are listed in Table 5-1.

Table 5-1. Selected analyte list for WAG 10 Track 2 sites.

| Analyte/Site  | Analytical Method   |
|---|---------------------|
| Buried waste pipe south of CFA-674 (Site CFA-54)  |                     |
| Aroclor-1254  | SW-846 Method 8082B |
| Arsenic   | SW-846 Method 6010B |
| Cs-137  | Gamma spectrometry  |
| Mercury   | EPA Method 7471A    |
| Uranium isotopes  | Alpha spectrometry  |
| Dirt pile with naval smoke cans near INTEC (Site MISC-45)   |                     |
| Arsenic   | SW-846 Method 6010B |
| Aluminum  | SW-846 Method 6010B |
| Cadmium   | SW-846 Method 6010B |
| Lead  | SW-846 Method 6010B |
| Zinc  | SW-846 Method 6010B |
| Abandoned discharge pipeline between the TRA-608 building and the TRA-701 chemical waste pond (Site TRA-62) |                     |
| Arsenic   | SW-846 Method 6010B |
| Barium  | SW-846 Method 6010B |
| Manganese   | SW-846 Method 6010B |
| Mercury   | EPA Method 7471A    |
| Zinc  | SW-846 Method 6010B |
| Lead  | SW-846 Method 6010B |

All containers will be pre-cleaned (usually certified by the manufacturer) using the appropriate EPA-recommended cleaning protocols for the bottle type and sample analysis. Extra containers will be available in case of breakage, contamination, or the need to collect additional samples. Preprinted labels will be affixed to the sample containers before use and will contain the name of the project, sample identification number, location, depth, and requested analysis. After the sample is collected, the sample label will be completed with the date and time of sample collection, and the sample technician will use a waterproof black marker to initial the sample label. The samples will be placed in coolers with reusable ice packs or dry ice, if required, while awaiting preparation and shipment to the appropriate laboratory. Samples will be prepared and packaged in accordance with MCP-3480, "Environmental Instructions for Facilities, Processes, Materials, and Equipment."

Radiological control technicians will screen samples from all sites to ascertain whether the samples meet the release criteria for unrestricted use. If a sample does not meet these criteria, it will be subjected to a 20-min gamma screen to ascertain the concentration of radionuclides present and the hazardous material classification for shipping purposes. The Radiation Measurements Laboratory at the RTC will do the gamma screening. All materials will be shipped to the laboratories by a company-certified hazardous materials shipper in accordance with U.S. Department of Transportation regulations and current company policy.

## **5.2 Waste Disposal**

Waste storage and disposal will be coordinated with the appropriate Waste Generator Services (WGS) interface to ensure compliance with applicable waste characterization, treatment, and disposal regulations. This includes writing a hazardous waste determination (Form 435.39) before treatment or disposal of any solid waste from this project. In addition, records will be kept in accordance with MCP-557, "Managing Records." The investigation-derived waste (IDW) produced during sampling will include personal protective equipment (PPE), sampling supplies, drill cuttings, and decontamination water. A hazardous waste determination will be performed and documented for each waste stream before the waste is disposed of. Specific company requirements and guidance on waste and excess material management can be found in the *Idaho National Engineering and Environmental Laboratory Waste Acceptance Criteria* (DOE-ID 2005b), and MCP-3472, "Identification and Characterization of Environmentally Regulated Waste."

### **5.2.1 Solid Waste Management**

Solid waste generated during the sampling activities includes PPE trash and miscellaneous trash (i.e., wipes and packaging). Waste that does not come into direct contact with the sampled media or sampling equipment can be disposed of as nonconditional "cold" waste at the CFA landfill complex unless beta/gamma radiation and/or contamination above INL release criteria are detected.

All PPE and other disposable material directly used in sampling and decontamination will be bagged, sampled, and placed in containers recommended by WGS. Containers will be labeled "CERCLA IDW" under the direction of WGS and stored at the site inside the CERCLA waste storage unit until analytical results are received for the waste. At that time, the proper disposition of the waste will be coordinated with WGS.

If nonhazardous, radioactive waste is generated, it will be disposed of at the Radioactive Waste Management Complex, the Waste Experimental Reduction Facility, or the Idaho CERCLA Disposal Facility. Individual waste streams destined for disposal at any of these facilities will be approved for disposal in accordance with INL criteria.

### **5.2.2 Soil-specific Waste Management**

Non-INL laboratories will dispose of altered and unaltered samples as contractually required. The SAM Program may use the U.S. Department of Energy Idaho Operations Office analytical service make-buy policy to determine that INL laboratories will be used for this project. INL laboratories do not dispose of soil samples. Generally, returned samples should be restored to the collection site. To accomplish this, an approved hazardous waste determination must be completed, and the return of the sample must be consistent with the final remedy of the site. Only unused, unaltered samples in the original containers will be accepted if the samples must be returned from the laboratory. These samples will be managed in accordance with MCP-3470, "Temporary Waste Management Areas," and will be treated and disposed of in accordance with regulations based on the concentrations detected. If samples



contain polychlorinated biphenyls (PCBs) at regulated concentrations, the samples will be returned to the INL. Disposition of samples that are returned from the laboratory and cannot be restored to a collection site will be coordinated with the appropriate WGS interface to ensure compliance with applicable waste characterization, treatment, and disposal regulations. The laboratories are not expected to return any of the samples; nevertheless, all samples are expected to be eligible for return to the collection site.

Decontamination solutions used in small quantities might include deionized water or detergent. Generation of decontamination fluids that require containment during sampling is unlikely. Excess deionized water or detergent will be allowed to drain onto the ground near the feature that is being sampled. Using spray bottles to apply the fluids will minimize the amount of decontamination fluids produced.

### **5.3 Waste Minimization**

As part of the pre-job briefing, waste-reduction philosophies and techniques will be emphasized, and personnel will be encouraged to continuously try to improve methods. No one will use, consume, spend, or expend equipment or materials carelessly. Practices to be instituted to support waste minimization include, but are not limited to, the following:

- Restrict material (especially hazardous material) entering the control zones to that needed to accomplish the work.
- Substitute recyclable or burnable items for disposable items.
- Reuse items when practical.
- Segregate contaminated waste from uncontaminated waste.
- Segregate reusable items such as PPE and tools.



## **6. QUALITY**

The objective of this investigation is to provide sufficient characterization information to fill the identified data gaps. Data collected will be of sufficient quality and quantity to serve as inputs to the final comprehensive baseline risk assessment for the WAG 10 Track 2 summary report.

This FSP is to be used in conjunction with the QAPjP (DOE-ID 2004a). These documents present the functional activities, organizations, and quality assurance/quality control (QA/QC) protocols necessary to achieve the specified DQOs. Together, the QAPjP and the FSP constitute the sampling and analysis plan for WAG 10 sites evaluated under this Track 2 investigation. Project-specific quality requirements not addressed in the QAPjP or elsewhere in this document are discussed below.

### **6.1 Quality Control Sampling**

As outlined in Section 2, the objectives of this investigation vary depending on which site is being studied. The purpose of collecting and analyzing QA/QC samples is to allow for the acceptability of the bias and precision of the data in addition to the mean concentrations to be evaluated. The number and type of QA/QC samples required during remedial investigations are specified in the QAPjP. The specific QA/QC requirements for this project are discussed below.

#### **6.1.1 Duplicate Samples**

Duplicate samples will be collected in accordance with the QAPjP (DOE-ID 2004a). At least one duplicate sample will be collected for every 20 samples for each analysis type.

#### **6.1.2 Quality Assurance and Quality Control Sampling**

During the sampling discussed in this plan, duplicate samples and field and equipment blanks will be collected and analyzed to evaluate sample variability and measurement bias. The collected duplicate samples will be analyzed for the same suite of analytes as regular samples. The QA/QC samples to be collected and the planned analyses are shown in Appendix A.

### **6.2 Quality Assurance Objectives**

As outlined in the QAPjP (DOE-ID 2004a), quality assurance (QA) objectives are specified so that the data produced are of a known and sufficient quality for determining whether a risk to human health or the environment exists. Minimum precision, accuracy, completeness of measurements, and method detection limits are quantitative QA objectives specified in the QAPjP. Producing data that are representative and comparable are qualitative QA objectives.

#### **6.2.1 Precision**

Precision is a measure of the reproducibility of measurements under a given set of conditions. In the field, precision is affected by sample-collection procedures and the natural heterogeneity encountered in the environment. Overall precision (field and laboratory) can be evaluated by the use of duplicate samples collected in the field. Greater precision is typically required for analytes with very low action levels and concentrations that are close to background levels.

Laboratory precision will be based on the use of laboratory-generated duplicate samples or matrix spike/matrix spike duplicate samples. Laboratory precision will be evaluated during the method data validation process.

Field precision will be based on the analysis of collected field duplicate or split samples. When collecting samples for laboratory analyses, a field duplicate will be collected at a minimum frequency of one in 20 environmental samples.

Precision of field screening samples for metals and field measurements for radionuclides will be based on the collection of duplicate samples and duplicate measurements. Duplicate samples and measurements will be collected at a frequency of one in 20 field screening samples and one in 20 field measurements.

### **6.2.2 Accuracy**

Accuracy is a measure of bias in a measurement system. Laboratory accuracy is demonstrated using laboratory control samples, blind quality control (QC) samples, and matrix spikes. Laboratory accuracy will be evaluated during the method data validation process. Sample handling, field contamination, and the sample matrix in the field affect overall accuracy. False positive or high-biased sample results will be assessed by evaluating results from field blanks, trip blanks, and equipment rinsates.

Field accuracy will only be determined for samples collected for laboratory analysis. The accuracy of field instrumentation will be ensured through the use of appropriate calibration procedures and standards.

### **6.2.3 Method Detection Limits**

Detection limits for laboratory analyses will meet or exceed the risk-based or decision-based concentrations for the COPCs. Detection limits will be as specified in the SAM laboratory master task agreement statements of work and task order statements of work and as described in the QAPjP (DOE-ID 2004a).

### **6.2.4 Representativeness**

Representativeness is a qualitative parameter that expresses the degree to which the sampling and analysis data accurately and precisely represent a population parameter at a given sampling point. Representativeness can also be a qualitative parameter for a process or environmental condition. Representativeness will be evaluated by ascertaining whether measurements and physical samples appropriately gauge the media and phenomenon. The comparison of all field and laboratory analytical data sets obtained throughout this remedial action will be used to ensure representativeness.

### **6.2.5 Comparability**

Comparability is a qualitative characteristic that refers to the confidence with which one data set can be compared to another. An evaluation of the sampling design, sampling procedures, sample handling, and laboratory analyses will be included in the assessment of data comparability. If consistently applied for all samples, then the data are comparable. Other methods to ensure comparability of data are use of the standard QAPjP, use of common analytical methods, reporting in comparable units of measurement, and use of standard data validation and data management practices.

### **6.2.6 Completeness**

Completeness is a measure of the quantity of usable data collected during the field sampling activities. The QAPjP (DOE-ID 2004a) requires that an overall completeness goal of 90% be achieved for noncritical samples. If critical parameters or samples are identified, a 100% completeness goal is specified (DOE-ID 2004a). For this project critical samples include the following:

- CFA-54: samples from the first sample interval beneath the pipe are critical samples.
- MISC-45: all samples are critical samples.
- TRA-62: samples from the first sample interval beneath the pipe are critical samples.

### **6.2.7 Data Validation, Reduction, and Reporting**

For new samples collected during this investigation, data will be acquired, processed, and controlled before being put into the Integrated Environmental Data Management System (IEDMS) in accordance with MCP-3480 and PRD-5030. For each sample delivery group, a data limitations and validation report that includes copies of chain-of-custody forms, sample results, and validation flags will be generated. All data limitations and validation reports associated with a site will be transmitted to the EPA and the Idaho Department of Environmental Quality. All definitive data will be uploaded to the Environmental Data Warehouse. The results of the complete data reduction and interpretation (including QA/QC results) will be provided in the summary report.

The SAM Program will validate the data to Level A, as defined in Guide (GDE)-7003, “Levels of Analytical Method Data Validation.” The analytical method data validation will be conducted in accordance with GDE-205, “Radioanalytical Data Validation”; GDE-239, “Validation of Volatile Organic Compounds Data Analyzed Using Gas Chromatography/Mass Spectrometry”; GDE-240, “Validation of Gas and Liquid Chromatographic Organic Data”; and GDE-201, “Inorganic Analyses Data Validation for INEEL Sample and Analysis Management.” Validated data are entered in the IEDMS and uploaded to the Environmental Data Warehouse.

For review of historical data, the Track 2 summary report will include information concerning the data used. That report will include a discussion of limitations on the ability to evaluate the data due to the statement of work used to define the requirements to the laboratory. Often, waste characterization activities require less QC data reporting than analyses conducted under SAM Program contracts. This does not imply that the data are not usable for their intended purpose; it is discussed to ensure that data comparability is adequately addressed in the report.



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**Appendix A**

**Sampling and Analysis Plan Tables**



## Sampling and Analysis Plan Table for Chemical and Radiological Analysis

Plan Table Number: WAG10\_TRK2\_2005

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SAP Number: DOE/NE-ID-11224

Date: 07/19/2005

Plan Table Revision: 1.0

Project: WAG 10 TRACK 2 INVESTIGATION OF CFA-54, MISC-45, TRA-62

Project Manager: JOLLEY, WENDELL L

SMO Contact: KIRCHNER, D. R.

| Sample Description |             |               |           |                 | Planned Date | Sample Location |                  |          |            | Enter Analysis Types (AT) and Quantity Requested |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
|--------------------|-------------|---------------|-----------|-----------------|--------------|-----------------|------------------|----------|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|
|                    |             |               |           |                 |              |                 |                  |          |            | AT1  | AT2 | AT3 | AT4 | AT5 | AT6 | AT7 | AT8 | AT9 | AT10 | AT11 | AT12 | AT13 | AT14 | AT15 | AT16 | AT17 | AT18 | AT19 | AT20 |
| Sampling Activity  | Sample Type | Sample Matrix | Coil Type | Sampling Method |              | Area            | Type of Location | Location | Depth (ft) | R4   | Z4  | Z5  | Z6  | PC  | R9  |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054000          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-1 | 6          | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054001          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-1 | 10         | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054002          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-1 | 14         | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054003          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-2 | 6          | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054004          | REG/QC      | SOIL          | DUP       |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-2 | 10         | 2  |     |     | 2   | 2   | 2   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054005          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-2 | 14         | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054006          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-3 | 6          | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054007          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-3 | 10         | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054008          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-3 | 14         | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054009          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-4 | 6          | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054010          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-4 | 10         | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054011          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-4 | 14         | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054012          | REG/QC      | SOIL          | DUP       |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-5 | 6          | 2  |     |     | 2   | 2   | 2   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054013          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-5 | 10         | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054014          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-5 | 14         | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |

The sampling activity displayed on this table represents the first 6 to 9 characters of the sample identification number.

The complete sample identification number will appear on the sample labels.

D - Double QC Volume T - Triple QC Volume

AT1: Gamma Spec

AT11:

Comments:

AT2: Metals Set # 1

AT12:

PCBs - Aroclor-1254

AT3: Metals Set # 2

AT13:

Gamma Spec - Cs-137

AT4: Metals Set # 3

AT14:

Metal Set # 1 - Arsenic, Barium, Lead, Manganese, Mercury, Zinc

AT5: PCBs

AT15:

AT6: U-Iso

AT16:

Metal Set # 2 - Arsenic, Aluminum, Cadmium, Lead, Zinc

AT7:

AT17:

Metal Set # 3 - Arsenic, Mercury

AT8:

AT18:

AT9:

AT19:

AT10:

AT20:

Analysis Suites:

Contingencies:

## Sampling and Analysis Plan Table for Chemical and Radiological Analysis

Plan Table Number: WAG10\_TRK2\_2005

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SAP Number: DOE/NE-ID-11224

Date: 07/19/2005

Plan Table Revision: 1.0

Project: WAG 10 TRACK 2 INVESTIGATION OF CFA-54, MISC-45, TRA-62

Project Manager: JOLLEY, WENDELL L

SMO Contact: KIRCHNER, D. R.

| Sample Description |             |               |           |                 | Planned Date | Sample Location |                  |           |            | Enter Analysis Types (AT) and Quantity Requested |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
|--------------------|-------------|---------------|-----------|-----------------|--------------|-----------------|------------------|-----------|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|
| Sampling Activity  | Sample Type | Sample Matrix | Coll Type | Sampling Method |              | Area            | Type of Location | Location  | Depth (ft) | AT1  | AT2 | AT3 | AT4 | AT5 | AT6 | AT7 | AT8 | AT9 | AT10 | AT11 | AT12 | AT13 | AT14 | AT15 | AT16 | AT17 | AT18 | AT19 | AT20 |
|                    |             |               |           |                 |              |                 |                  |           |            | R4   | Z4  | Z5  | Z6  | PC  | R9  |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054015          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-6  | 6          | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054016          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-6  | 10         | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054017          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-7  | 6          | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054018          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-7  | 10         | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054019          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-8  | 6          | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054020          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-8  | 10         | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054021          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-9  | 6          | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054022          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-9  | 10         | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054023          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-10 | 6          | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| CFA054024          | REG         | SOIL          | CORE      |                 | 8/1/05       | CFA             | BENEATH PIPE     | CFA-54-10 | 10         | 1  |     |     | 1   | 1   | 1   |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| MISC45000          | REG         | SOIL          | COMP      |                 | 8/1/05       | INTEC           | DIRT PILE        | MISC-45-1 | NA         |  |     | 1   |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| MISC45001          | QC          | SOIL          | DUP       |                 | 8/1/05       | INTEC           | DIRT PILE        | MISC-45-2 | NA         |  |     | 1   |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| MISC45002          | QC          | SOIL          | DUP       |                 | 8/1/05       | INTEC           | DIRT PILE        | MISC-45-3 | NA         |  |     | 1   |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062000          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-1  | 6          |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062001          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-1  | 10         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |

The sampling activity displayed on this table represents the first 6 to 9 characters of the sample identification number.

The complete sample identification number will appear on the sample labels.

D - Double QC Volume T - Triple QC Volume

AT1: Gamma Spec

AT11:

Comments:

AT2: Metals Set # 1

AT12:

PCBs - Aroclor-1254

AT3: Metals Set # 2

AT13:

Gamma Spec - Cs-137

AT4: Metals Set # 3

AT14:

Metal Set # 1 - Arsenic, Barium, Lead, Manganese, Mercury, Zinc

AT5: PCBs

AT15:

Metal Set # 2 - Arsenic, Aluminum, Cadmium, Lead, Zinc

AT6: U-Iso

AT16:

Metal Set # 3 - Arsenic, Mercury

AT7:

AT17:

AT8:

AT18:

AT9:

AT19:

AT10:

AT20:

Analysis Suites:

Contingencies:

Sampling and Analysis Plan Table for Chemical and Radiological Analysis

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SAP Number: DOE/NE-ID-11224

Date: 07/19/2005

Plan Table Revision: 1.0

Project: WAG 10 TRACK 2 INVESTIGATION OF CFA-54, MISC-45, TRA-62

Project Manager: JOLLEY, WENDELL L

SMO Contact: KIRCHNER, D. R.

| Sample Description |             |               |           |                 | Planned Date | Sample Location |                  |          |            | Enter Analysis Types (AT) and Quantity Requested |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
|--------------------|-------------|---------------|-----------|-----------------|--------------|-----------------|------------------|----------|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|
| Sampling Activity  | Sample Type | Sample Matrix | Coll Type | Sampling Method |              | Area            | Type of Location | Location | Depth (ft) | AT1  | AT2 | AT3 | AT4 | AT5 | AT6 | AT7 | AT8 | AT9 | AT10 | AT11 | AT12 | AT13 | AT14 | AT15 | AT16 | AT17 | AT18 | AT19 | AT20 |
|                    |             |               |           |                 |              |                 |                  |          |            | R4   | Z4  | Z5  | Z6  | PC  | R9  |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062002          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-1 | 14         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062003          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-1 | 18         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062004          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-2 | 6          |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062005          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-2 | 10         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062006          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-2 | 14         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062007          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-2 | 18         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062008          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-3 | 6          |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062009          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-3 | 10         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062010          | REG/QC      | SOIL          | DUP       |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-3 | 14         |  | 2   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062011          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-3 | 18         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062012          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-4 | 6          |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062013          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-4 | 10         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062014          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-4 | 14         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062015          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-4 | 18         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062016          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-5 | 6          |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |

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The complete sample identification number will appear on the sample labels.

D - Double QC Volume T - Triple QC Volume

AT1: Gamma Spec

AT11:

Comments:

AT2: Metals Set # 1

AT12:

PCBs - Aroclor-1254

AT3: Metals Set # 2

AT13:

Gamma Spec - Cs-137

AT4: Metals Set # 3

AT14:

Metal Set # 1 - Arsenic, Barium, Lead, Manganese, Mercury, Zinc

AT5: PCBs

AT15:

Metal Set # 2 - Arsenic, Aluminum, Cadmium, Lead, Zinc

AT6: U-Iso

AT16:

AT7:

AT17:

Metal Set # 3 - Arsenic, Mercury

AT8:

AT18:

AT9:

AT19:

AT10:

AT20:

Analysis Suites:

Contingencies:

Sampling and Analysis Plan Table for Chemical and Radiological Analysis

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SAP Number: DOE/NE-ID-11224

Date: 07/19/2005

Plan Table Revision: 1.0

Project: WAG 10 TRACK 2 INVESTIGATION OF CFA-54, MISC-45, TRA-62

Project Manager: JOLLEY, WENDELL L

SMO Contact: KIRCHNER, D. R.

| Sample Description |             |               |           |                 | Planned Date | Sample Location |                  |          |            | Enter Analysis Types (AT) and Quantity Requested |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
|--------------------|-------------|---------------|-----------|-----------------|--------------|-----------------|------------------|----------|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|
| Sampling Activity  | Sample Type | Sample Matrix | Coll Type | Sampling Method |              | Area            | Type of Location | Location | Depth (ft) | AT1  | AT2 | AT3 | AT4 | AT5 | AT6 | AT7 | AT8 | AT9 | AT10 | AT11 | AT12 | AT13 | AT14 | AT15 | AT16 | AT17 | AT18 | AT19 | AT20 |
|                    |             |               |           |                 |              |                 |                  |          |            | R4   | Z4  | Z5  | Z6  | PC  | R9  |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062017          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-5 | 10         | 1  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062018          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-5 | 14         | 1  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062019          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-5 | 18         | 1  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062020          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-6 | 6          | 1  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062021          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-6 | 10         | 2  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062022          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-6 | 14         | 1  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062023          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-6 | 18         | 1  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062024          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-7 | 6          | 1  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062025          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-7 | 10         | 1  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062026          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-7 | 14         | 1  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062027          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-7 | 18         | 1  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062028          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-8 | 6          | 1  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062029          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-8 | 10         | 1  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062030          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-8 | 14         | 1  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062031          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-8 | 18         | 1  |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |

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D - Double QC Volume T - Triple QC Volume

AT1: Gamma Spec  
 AT2: Metals Set # 1  
 AT3: Metals Set # 2  
 AT4: Metals Set # 3  
 AT5: PCBs  
 AT6: U-Iso  
 AT7:  
 AT8:  
 AT9:  
 AT10:

AT11:  
 AT12:  
 AT13:  
 AT14:  
 AT15:  
 AT16:  
 AT17:  
 AT18:  
 AT19:  
 AT20:

Comments:  
 PCBs - Aroclor-1254  
 Gamma Spec - Cs-137  
 Metal Set # 1 - Arsenic, Barium, Lead, Manganese, Mercury, Zinc  
 Metal Set # 2 - Arsenic, Aluminum, Cadmium, Lead, Zinc  
 Metal Set # 3 - Arsenic, Mercury

Analysis Suites:

Contingencies:

## Sampling and Analysis Plan Table for Chemical and Radiological Analysis

Plan Table Number: WAG10\_TRK2\_2005

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SAP Number: DOE/NE-ID-11224

Date: 07/19/2005

Plan Table Revision: 1.0

Project: WAG 10 TRACK 2 INVESTIGATION OF CFA-54, MISC-45, TRA-62

Project Manager: JOLLEY, WENDELL L

SMO Contact: KIRCHNER, D. R.

| Sample Description |             |               |           |                 | Planned Date | Sample Location |                  |           |            | Enter Analysis Types (AT) and Quantity Requested |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
|--------------------|-------------|---------------|-----------|-----------------|--------------|-----------------|------------------|-----------|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|
|                    |             |               |           |                 |              |                 |                  |           |            | AT1  | AT2 | AT3 | AT4 | AT5 | AT6 | AT7 | AT8 | AT9 | AT10 | AT11 | AT12 | AT13 | AT14 | AT15 | AT16 | AT17 | AT18 | AT19 | AT20 |
| Sampling Activity  | Sample Type | Sample Matrix | Coll Type | Sampling Method |              | Area            | Type of Location | Location  | Depth (ft) | R4   | Z4  | Z5  | Z6  | PC  | R9  |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062032          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-9  | 6          |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062033          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-9  | 10         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062034          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-9  | 14         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062035          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-9  | 18         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062036          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-10 | 6          |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062037          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-10 | 10         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062038          | REG/QC      | SOIL          | DUP       |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-10 | 14         |  | 2   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062039          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62-10 | 18         |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062040          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62    | TBD        |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062041          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62    | TBD        |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062042          | REG/QC      | SOIL          | DUP       |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62    | TBD        |  | 2   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062043          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62    | TBD        |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062044          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62    | TBD        |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062045          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62    | TBD        |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| TRA062046          | REG         | SOIL          | CORE      |                 | 8/1/05       | TRA             | BENEATH PIPE     | TRA-62    | TBD        |  | 1   |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |

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AT11:

Comments:

AT2: Metals Set # 1

AT12:

PCBs - Aroclor-1254

AT3: Metals Set # 2

AT13:

Gamma Spec - Cs-137

AT4: Metals Set # 3

AT14:

Metal Set # 1 - Arsenic, Barium, Lead, Manganese, Mercury, Zinc

AT5: PCBs

AT15:

Metal Set # 2 - Arsenic, Aluminum, Cadmium, Lead, Zinc

AT6: U-Iso

AT16:

AT7:

AT17:

Metal Set # 3 - Arsenic, Mercury

AT8:

AT18:

AT9:

AT19:

AT10:

AT20:

Analysis Suites:

Contingencies:

SMO Contact: KIRCHNER, D. R.

| The sampling activity displayed on this table represents the first 6 to 9 characters of the sample identification number. |                | The complete sample identification number will appear on the sample labels. |  | D - Double QC Volume | T - Triple QC Volume  |
|---|----------------|---|--|----------------------|---|
| AT1:  | Gamma Spec     | AT11:   |  | Comments:            |   |
| AT2:  | Metals Set # 1 | AT12:   |  | PCBs - Aroclor-1254  |   |
| AT3:  | Metals Set # 2 | AT13:   |  |                      |   |
| AT4:  | Metals Set # 3 | AT14:   |  | Gamma Spec - Cs-137  |   |
| AT5:  | PCBs           | AT15:   |  |                      | Metal Set # 1 - Arsenic, Barium, Lead, Manganese, Mercury, Zinc |
| AT6:  | U-Iso          | AT16:   |  |                      | Metal Set # 2 - Arsenic, Aluminum, Cadmium, Lead, Zinc          |
| AT7:  |                | AT17:   |  |                      | Metal Set # 3 - Arsenic, Mercury                                |
| AT8:  |                | AT18:   |  |                      |   |
| AT9:  |                | AT19:   |  |                      |   |
| AT10:   |                | AT20:   |  |                      |   |

Contingencies:

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A-8